

USE OF IN-SITU AND REMOTELY SENSED OBSERVATIONS FOR THE OPTIMIZATION OF HYDROLOGIC MODEL RESULTS

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The objective of this presentation is to give two examples of a technique used to optimize hydrologic model results. These models simulate the flow of water within a catchment. For this purpose the mass balance (partitioning of the precipitation into infiltration, evapotranspiration and surface runoff) and the energy balance (partitioning of the net radiation into latent, sensible, and ground heat fluxes) need to be solved simultaneously, because they are linked through the evapotranspiration. Even though these models can be of varying complexity (from simple black-box models to detailed and complex physically based models) they will never lead to perfect results. The reasons for these errors are oversimplifications in the model physics, errors in the meteorological data used to force the model, errors in the model initial conditions, and errors in the topographic, soil, and vegetation parameters used as input to the model. One way to solve this problem is to regularly update the model state (e.g. soil wetness or temperature) using external data sets. This updating of model results using independently obtained data sets is commonly referred to as data assimilation. In this presentation, two examples of the application of data assimilation in hydrology are explained.

The objective of the first experiment was to improve discharge forecasts of a hydrologic model through the assimilation of satellite-based soil moisture data. The study was performed in the drainage basin of the Zwalm river in Belgium. Satellite-derived soil moisture values from the ERS/1 and ERS/2 satellites were assimilated into a fully physical process-based hydrologic model. The conclusions of this study were that it is possible to derive soil moisture values using satellite-based backscatter data without in-situ measuring soil parameters, and that the assimilation of these soil moisture data can improve discharge forecasts.

In the second experiment it was attempted to improve catchment-scale latent and sensible heat fluxes through the assimilation of observed discharge. The assimilation of discharge has a number of advantages as compared to the assimilation of remotely sensed data sets: discharge data are usually continuously measured with a relatively high degree of accuracy. Further, they are measured across different spatial scales, as opposed to satellite data, which are measured at a fixed spatial resolution. The first conclusion of this work was that erroneous initial conditions can be corrected through the assimilation of observed discharge. The second conclusion was that the modeled water and energy balance variables can be corrected when the precipitation used to force the model contains significant errors.

As a general conclusion from these two experiments, it can be stated that there is a wide potential to improve hydrologic model results through data assimilation. The last section of this poster will briefly discuss some further projects that will be executed at the Laboratory of Hydrology and Water Management in the future.